

Claims

1 1. A tool holder apparatus, comprising:

2 an elongated shank intended to be supported for rotation
3 about a turning axis, said shank having an internal female frustoconical opening
4 at a first end thereof, and an axial first bore having an inner end opening to said
5 frustoconical opening;

6 an elongated tool holder having a first end for supporting a
7 cutting tool in a cutting position, an external male frustoconical structure
8 receivable in the frustoconical opening of the shank, and a narrow second end
9 having an expandable outer surface and axial slots;

10 the narrow end of the tool holder has an axial bore therein;

11 threaded camming structure movably mounted in the tool
12 holder second bore;

13 an elongated drawing member received in said first bore of
14 the shank, the drawing member having an inner threaded end disposed in said
15 frustoconical opening engageable with the threaded structure in the tool holder
16 such that as the drawing member is turned about said turning axis in a first
17 direction, the male end of the tool holder is moved toward a locked position in the
18 female end of the shank, and as the drawing member is turned in the opposite
19 direction, the tool holder is axially movable away from the shank;

20 the tool holder having a second bore intersecting said first
21 bore;

22 the threaded structure in said second bore comprising;

23 camming structure disposed in the second bore of the tool
24 holder, the camming structure having a threaded bore for receiving the inner
25 threaded end of the drawing member; and
26 the camming structure being axially movable to a camming
27 position in the second bore to expand the slotted narrow second end of the tool
28 holder into engagement with the female opening of the shank; the drawing
29 member being operative to move the camming structure to expand the male
30 frustoconical structure in the female opening to a locked position.

1 2. A tool holder apparatus as defined in claim 1, in which the male
2 second end of the tool holder has a cylindrical expandable outer surface, and the
3 camming structure is engageable with said second end to expand the second
4 end in a female cylindrical cavity of the shank to prevent rotational motion of the
5 tool holder and said shank.

1 3. A tool holder apparatus as defined in claim 2, in which the second
2 end of the tool holder has a pair of axial slots permitting expansion of said
3 second end.

1 4. A tool holder apparatus as defined in claim 3, in which the slots
2 extend to the extreme end of the tool holder second end.

1 5. A tool holder apparatus as defined in claim 3, in which said axial
2 slots have ends spaced from the extreme end of the tool holder second end.

1 6. A tool holder apparatus as defined in claim 1, in which the drawing
2 member is a draw screw.

1 7. A tool holder apparatus as defined in claim 1, in which the drawing
2 member is a cap screw.

1 8. A tool holder apparatus as defined in claim 2, in which the tool
2 holder has a plug-receiving opening between a narrow end of the frustoconical
3 structure, and a cylindrical end, and the camming structure includes a plug-
4 receivable in the plug-receiving opening in which a threaded opening in the plug
5 is aligned in the tool holder's first bore to threadably engage the drawing
6 member.

1 9. A tool holder apparatus as defined in claim 3, in which the plug is
2 disposed in the narrow end of the tool holder adjacent said slots to expand the
3 expandable outer surface of the tool holder by increasing the distance between
4 opposite sides of the slots.

1 10. A tool holder apparatus as defined in claim 1, in which the camming
2 structure comprises the plug having a pair of keys that extend beyond the outer
3 surface of the expandable outer surface of the tool holder, and the female end
4 has a pair of slots for receiving the keys to prevent rotation of the tool holder with
5 respect to the shank.

1 11. A tool holder apparatus, comprising:
2 an elongated shank intended to be supported for rotation
3 about an axial turning axis, said shank having an internal female frustoconical
4 opening at a first end thereof, and an axial first bore having an inner end opening
5 to said frustoconical opening first end;
6 an elongated tool holder having a first end for supporting a
7 cutting tool in a cutting position, an external male frustoconical structure
8 receivable in the frustoconical opening of the shank the tool holder having a
9 second end having an expandable outer surface, the tool holder's second end
10 having an axial second bore therein;
11 threaded camming structure mounted in the tool holder
12 second bore;
13 a differential draw screw received in said shank's first bore,
14 the differential draw screw having an inner end disposed in the shank opening
15 and an opposite end engaged with the camming structure such that as the
16 differential draw screw is turned about said turning axis in a first direction, the
17 male end of the tool holder is moved toward a locked position in the female end

18 of the shank, and as the differential draw screw is turned in the opposite
19 direction, the tool holder is axially movable away from the shank;
20 said camming structure comprising said second bore
21 comprising;
22 a camming member disposed in the second bore of the tool
23 holder, the camming member having a threaded bore for receiving the inner end
24 of the differential draw screw; and
25 the camming structure being axially movable in the second
26 bore of the tool holder to expand the frustoconical section of the male structure
27 into engagement with the shank female opening; the differential draw screw
28 being operative to axially move the camming structure toward the shank
29 frustoconical opening.

1 12. A tool holder apparatus as defined in claim 11, including means for
2 preventing relative rotation between the tool holder and the shank when the
3 external frustoconical structure of the tool holder is inserted into the frustoconical
4 opening of the shank.

1 13. A tool holder apparatus as defined in claim 12, in which the tool
2 holder has an annular seat around said turning axis, and the differential draw
3 screw moves the tool holder along said turning axis to a position in which the
4 annular seat on the tool holder has pressure engagement with an end face of the
5 shank.

1 14. A tool holder apparatus as defined in claim 11, wherein the shank
2 has a pin-receiving opening, and the tool holder has a pin-receiving opening,
3 facing the pin-receiving opening the tool holder member, and including a pin
4 disposed in both of said pin-receiving openings to prevent the tool holder
5 member from turning about said turning axis with respect to the shank.

1 15. A tool holder apparatus as defined in claim 14, in which the pin-
2 receiving opening in the tool holder member is disposed in a radial direction and
3 intersects an annular seat of the tool holder, and the pin-receiving opening in the
4 shank is disposed in a radial direction and intersects an end face of the shank.

1 16. A tool holder apparatus as defined in claim 1, in which the tool
2 holder carries an integrally mounted tool for a cutting motion.

1 17. A tool holder apparatus as defined in claim 1, in which the drawing
2 member has an end with a wrench-receiving opening, and the shank provides
3 access through the shank for a wrench to engage and turn the drawing screw
4 along said turning axis.